ACRYLIC-NITRILE FOAM-BACKED FABRIC AND METHOD OF PREPARATION

This application is a continuation-in-part application of U.S. Ser. No. 72,819, filed Sept. 16, 1970, which application is a continuation-in-part application of U.S. Ser. No. 683,828, filed Nov. 17, 1967 (now abandoned).

BACKGROUND OF THE INVENTION

Foams formed from foamable latex compositions have found increasing utility practicularly as coatings or laminated to fabrics to impart various properties thereto such as increased thermo-insulation, resistance to water and solvents, opacity, and acoustical insulation. Further, the properties of flexibility, color fastness to light, breathability and soft hand must also often be attainable. In the past, however, the preparation of foamable compositions to provide some of these properties often resulted in the loss of other properties.

Foamable acrylic resins, while providing good color fastness to light often failed to provide the desired wash and solvent resistance, and fabrics coated therewith were too stiff, i.e., had poor hand. Polyvinyl chloride plasticized resins generally have poor temperature resistance and the plasticizers may migrate into the fabric thus reducing flexibility and discoloring the fabric. Urethane compositions have poor resistance to sunlight. Natural and synthetic elastomers and their carboxylic derivatives are often not suitable because of their tendency to discolor upon use, due in part to the residual conjugated bonds in the elastomer.

In spite of their shortcomings, acrylic resins are desirable for forming foams, and particularly for coating drapery fabrics with foams because of the excellent low temperature resistance, lack of necessity for external plasticication and good color fastness on exposure to light. Particular acrylic resin compositions have been known and employed in coating fabrics. For example, in U.S. Pat. No. 3,290,023, issued Jan. 3, 1967, to A.J. Leaderman et al, a coated fabric is disclosed employing an acrylic resin polymerized in situ by the use of an acid catalyst, to obtain thermoinsulating properties by the use of specific ranges of filler material. However, such resins are not foamed and as the desire for increased thermoinsulating characteristics and the need for heavier coatings increase, the flexibility and hand of fabrics coated with such a solid coating rapidly diminishes. In addition, such coatings are not breathable and have limited usefulness where breathability is desired, such as in apparel lining and rainwear.

U.S. Pat. No. 2,868,752, issued Jan. 13, 1959 to Frasier et al discloses a particular acrylic composition which employs a specific anionic emulsifier. Such a composition is deficient in forming an acceptable foam structure. U.S. Pat. No. 3,215,647, issued Nov. 2, 1965 to E.R. Dunn discloses a particular copolymer which is subject to the aforementioned deficiencies of the elastomers. The above patents are incorporated by reference herein in their entirety.

Accordingly, it is one object of this invention to provide a foamable latex composition, which when foamed and coated on a support such as a fabric provides a product which possesses a good hand, light fastness, abrasion resistance and can be dry cleaned.

An object of this invention is to provide a foam-coated sheet material, which material is coated with a foamed acrylic-nitrile copolymer.

Another object of this invention is to provide a method for preparing a densified foam-coated fabric, which coated fabric has excellent drape and hand properties.

A further object is to provide a densified acrylic-nitrile foam-coated fabric characterized by enhanced wash and dry-cleaning solvent resistance and improved thermal and acoustical insulating properties.

SUMMARY OF THE INVENTION

This invention relates to a foam-coated sheet material, particularly having a densified, cured, acrylic-nitrile copolymeric foam coating thereon to provide a product, such as drapery fabric, which is capable of being dry cleaned, substantially free from surface tack, breathable; i.e., in passing moisture vapor but not water, good color fastness to light exposure such as sunlight, opaque, yet of light weight with good thermal or acoustical insulating properties. One surprising feature of this invention is that the coated fabric often has better hand, drape and flexibility properties after densification and cross-linking or curing than before, while normally, such curing without densification would increase the stiffness of such fabric.

The improved water and solvent resistance and other properties of this coated fabric are obtained in part by the use of a foamable latex of an acrylic-nitrile copolymer which provides enhanced solvent resistance for organic solvents in particular, and which permits curing by the use of cross-linking resins, such as amino-aldehyde resins. The improved thermal and acoustical properties of the coated fabric together with control of opacity are obtained through the use of an essentially open-cell foam structure of the coating. The use of a foam coating permits many advantages without a substantial increase in coating weight, and therefore, it is also less expensive than employing a solid coating which would significantly reduce the breathability of the coated fabric. The combination of our acrylic-nitrile copolymer and the foam structure with the further step of densifying the foam so formed provides a coated fabric which is flexible and has soft-hand and good drape characteristics. Such coated fabrics have a surprising number of advantages over those coated fabrics employing other latex copolymers.

The novel foams of this invention are prepared by foaming the acrylic-nitrile latex copolymer composition by the introduction of a gas, such as air, and/or by mechanical beating. The foamed copolymer composition is then coated on a substrate, such as the surface of a sheet material; e.g., a fabric, and the coating is then dried, e.g., at a temperature of less than about 300°F; e.g., 240°–300°F, and for a time period insufficient to cure or cross-link significantly or substantially the acrylic-nitrile copolymer, but to dry the foam. In this manner, a dried rigid or semirigid thin foam coating is obtained on the fabric, which coating is then subsequently densified; that is, increased in foam density, such as by passing the coated fabric through one or more calendering and/or embossing operations. For example, the coated fabric may be passed through a combination of calender and embossing rolls to reduce the foam thickness of the lightly cross-linked dried foam coating more than about 20 percent, for example, 40–80 percent, and to impart a particular embossed design on the surface thereof. The densified foam-